

# Here Comes the Helmet of the Future!

A fire helmet is a key component of personal protective equipment.

Dräger plans to use a new **PRODUCTION FACILITY** to generate momentum here—and to be a trendsetter.

**DRÄGER?** Respiratory protection! That's the answer firefighters immediately give when they are asked about products made by the Lübeck-based company. Dräger usually isn't associated with fire helmets, even though the company has developed models such as the HPS 4300 and the HPS 6200 entirely in-house. So far these have been produced by a supplier. That's about to change, however, as the company will soon launch its own production operations at a facility in Chomutov, Czech Republic.

"We already offer an extensive product line-up of personal protective equipment, but until now we haven't been well-known for fire helmets," says Markus Lamm, Dräger Portfolio Manager and also responsible for strategic issues concerning head protection. "The helmet is an integral component of a protection system for firefighters," he adds. The fire helmets are to be produced by a joint venture with the German company Busch that was specifically established to make the helmets. The new company, known as Dräger Busch Helmets Production s.r.o., will produce only Dräger helmets.

## About 80 individual parts

Gaining Busch as a partner company was a smart strategic move: "It combines the production experience of Busch with Dräger's project management in product development, and its process management in production," says Dräger production expert Werner Jumpertz, one of the new manufacturing firm's two managing directors. The new production operation also is seen as a way to generate momen-



A helmet is also more than the sum of its parts—and every one of them has been optimized for extreme safety.



Perfect gloss: Manual grinding and polishing is time-consuming, but there's nothing better for the perfect combination of form and function.

tum with fire helmets—and to expand the range of business possibilities. A fire helmet consists of about 80 individual parts, and a manufacturer must always consider how each part can be further improved. The result must be oriented toward prevailing market prices and should be affordable—without sacrificing quality or safety. Calculating the price involves determining which parts can be produced by other companies at a lower cost (outsourcing), and which could be better produced in-house. A company engaged in this process almost always prefers its own solutions. Today the vertical range of manufacture extends down to the smallest detail. The synthetic material Nomex is purchased from outside for the helmets, but the stitching it requires—for production of the helmet liners, for example—is handled by Dräger. Quality is an obligation. "The customer expects that a helmet with the name Dräger on the outside will also be Dräger on the inside," says Markus Lamm. "And some day we may see helmets with built-in thermal imaging cameras and displays integrated into their visors," says his colleague Jumpertz.

## An ambitious goal

Egon Busch, the founder and managing director of the company that bears his name, is confident the new joint venture will be a success. Although up until now, the company's products have not included fire helmets, the specialists at Busch did score a major coup by producing the Germany military's combat helmet. Made of aramid fibers, the helmet's shell provides unsurpassed puncture protection

and is very comfortable to wear. Today this helmet construction has a global market share of about 80 percent. "We want to bring the world's best fire helmet to market," says Egon Busch in summing up the objective of Dräger Busch Helmets Production. The entrepreneur from Gütersloh, who will serve as the joint venture's other managing director, is certain this goal will be attained.

Of added benefit here is the fact that the helmet market is relatively resistant to crises: "Even at times like these, the safety of fire and rescue personnel will not be compromised," says Busch. "The need for safety is increasing—along with demand for high-quality protective equipment."

## The helmet as part of a system

The helmet, which is compatible with all attachments and accessories as part of a complete system, has a central role to play here. With development and production from a single source, new opportunities emerge: "It is now much easier and much less time-consuming to realize an integrated head-protection system, in which the helmet, mask, and accessories—for example communication and monitoring systems—perfectly complement one another and thus contribute to greater safety," says Lamm. The integration of new functions and sensor technology in the helmet raises new questions, however. "Enhanced sensor technology for monitoring firefighting and rescue operations and improved visualization technologies must be critically evaluated in terms of their usefulness for fire departments," explains Jumpertz. "Just because something

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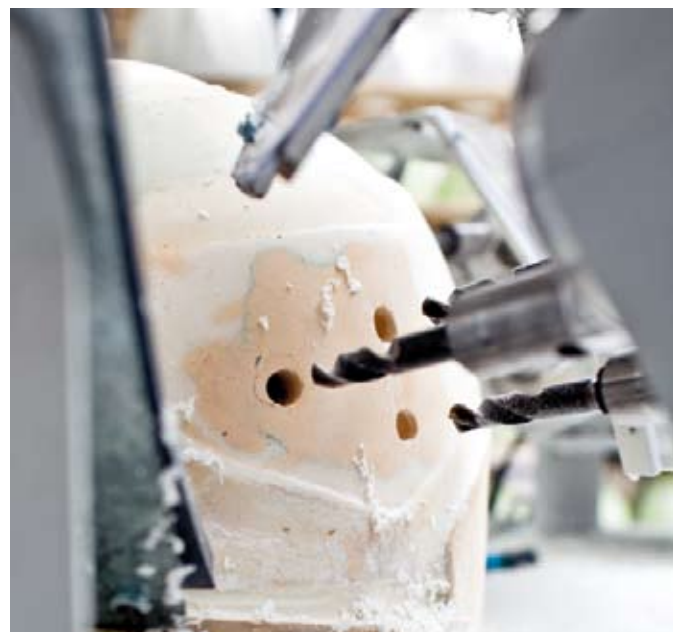


One a minute: A five-armed coating robot applies one of seven colors to the helmet.

## Safety is built in with the steps of production



Despite the high degree of automation, it is skilled personnel who provide the final touch of quality.



A computer-controlled machine tool drills mounting holes, which will later be carefully inspected by critical eyes.



PHOTOGRAPHY: SVEN DÖRING

> is technically possible today doesn't mean it should be used. Some system ideas, for example health monitoring during rescue operations, pose new concerns in terms of safety. And in any case, the Dräger BodyGuard II signal and warning unit for compressed air breathing apparatus already enables firefighters today to not only gauge device data but also measure ambient temperature and telemetrically forward this information to a command center."

There are several versions of the helmet-mask combination. With the S-Fix system, breathing masks such as the Dräger FPS-7000 are clamped to the helmet's exterior, which means the mask can be used in combination with helmets from other manufacturers, and vice versa. The HPS 6200 helmet, on the other hand, is available with the alternative Q-Fix system, which makes it suitable for use with the Dräger-FPS-7000 full-face mask. With this combination, an additional safety button is used to prevent the breathing mask from becoming unclamped as a result of an impact. This shows how an optimally coordinated system can ensure a higher level of safety. In addition to helmet-mask combinations, accessories available for Dräger fire helmets include spotlight attachments, which use Ex-protected LED or even extremely bright Xenon technology.

### Tomorrow's criteria: Safety and light weight

One man who would be delighted to see further technological advances is Dr. Dirk Hagebölling, the Chief of the Bochum Fire Department and Vice President of the

Hazardous Substances and Fire Protection Research Association. As chairman of the corresponding committee of the German Institute for Standardization (DIN), Hagebölling is extensively involved with the future of personal protective equipment.

"If you ask me about the need for new developments in terms of fire helmets, I would have to say there's an urgent need for a lightweight helmet variant," he says. "Such a helmet would be used above all by rescue personnel and technical assistance teams. The helmet primarily needs to be light and very comfortable to wear. We now have helmets on the international market for forest firefighters, which is a step in the right direction." Hagebölling also reports that the idea of having a lightweight helmet is already on the agenda of the standards committee.

Fire helmets for personnel wearing breathing apparatus should also be able to deliver important data by means of sensor technology. "The oxygen tank pressure

level and the temperature are crucial," says Hagebölling, which is why it should be easy to call up such data: "Do I have enough air, is an ambient temperature limit being exceeded to the point where a gas-oxygen mixture at ceiling level could ignite?" Cost concerns can be addressed by means of a modular concept. "Someone has to help the team leader put on his equipment while en route to the site anyway," Hagebölling says. "That person could simultaneously equip him with the necessary sensors, although not all functions are needed by all response personnel, of course. When it comes to lighting today, fire departments are still 'groping in the dark'. Powerful LED lights are already available, so they should be integrated into the helmet."

### The sum of all properties

Along with municipal fire departments, volunteer firefighters are authorized with the major line of firefighting defense in >

## The Dräger Helmet

The tradition-rich Lübeck-based company is breaking new ground with the in-house production of helmets. In the 1980s, Dräger entered into a collaboration with the French helmet manufacturer Gallet. The F1-series of helmets developed by Gallet for French firefighters was vastly different in terms of shape and color from any of the fire helmets used at that time. Dräger marketed this helmet very successfully (over a period of two decades) in Europe and Asia. Dräger has contracted with Schuberth for the production of its fire helmets since 2002. Schuberth also manufactures the BMW motorcycle helmet worn by the German police, and it developed the Formula 1 helmet worn by Michael Schumacher. Dräger will begin manufacturing fire helmets at the Dräger-Busch helmet factory in 2009.



PHOTOGRAPHY: SVEN DÖRING

> Germany. Compared to the 28,000 professional firefighters, the more than one million volunteers in the country form a veritable army. In Hesse, for example, only cities with more than 100,000 residents are required to have municipal fire departments. The small city of Neu-Isenburg (pop. 36,000), not far from Frankfurt, has a volunteer fire department with 120 firefighters, and nine full-time employees to manage the operations of this relatively large organization. One of them is Frank Burger, an equipment attendant for the Neu-Isenburg volunteer department: “A fire helmet must have what it takes for any possible response scenario,” says Burger. “One helmet for technical assistance teams and one for firefighters—that wouldn’t be economical for us.” Burger is hoping to see a modular helmet-shell concept. “We need a helmet with a light or a suitable light attachment, one that we can wear while still being able to hear clearly and handle radio communication.” After conducting its own evaluations of possible fire helmet choices, the Neu-Isenburg firefighters selected the HPS 6100 and the HPS 6200.

### Comfort is personal

“Head protection is of the utmost importance to firefighters, but there’s no such thing as the perfect helmet,” says Helge Weber. For many years, this veteran of the Berlin Fire Department was co-responsible for the procurement of protective clothing at a vehicle and equipment service unit. In September 2003, the Berlin Fire Brigade purchased the Dräger HPS 4100 helmet for all firefighters. This meant equipping ap-

## A recipe with a future

The basic shell design of Dräger fire helmets combines safety with comfort. The centerpiece of the Dräger “Head Protection System” (HPS) is a helmet shell of glass-fiber reinforced duroplastics. This exceptionally light combination of materials is extremely resistant to very low and very high temperatures. The tests for the certification of a fire helmet according to EN 443:2008 are very rigorous: A fire helmet must withstand a helmet temperature of nearly 300 °C for eight minutes while exposed to a heat flux of 14 kW/m<sup>2</sup>. The helmet should also survive ten seconds at 1,000 °C during “full engulfment” without catching fire or melting away. At temperatures between 250 and 270 degrees (depending on helmet color), Dräger helmets can withstand a five-kilogram ball dropped from a height of 2.5 meters, and effectively protect the head against the impact energy. It can also prevent penetration by a one-kilogram pointed object from a height of 2.5 meters.

proximately 5,000 firefighters belonging to both Germany’s largest professional fire department and the city’s volunteer fire departments. Today Weber works at the State Firefighting Academy, where his focus is on emergency vehicles, but as the Respiratory Protection Officer of the Berlin Fire Department he remains closely involved with the issue. “For interior attack, we use respiratory protection masks with a five-point head harness, a two-ply hood and the helmet.” The protective components also have to be put on in exactly this order. That sounds complicated, but there doesn’t appear to be any alternatives. “We currently use three different types of masks with various designs,” says Weber. “After all, facial shapes differ, and there are also female firefighters. This is the only way we could optimally equip nearly


5,000 firefighters, both male and female.” Weber has no doubts about what characterizes a good fire helmet: “High comfort and low weight are important.”

The professional fire department in the Danish capital of Copenhagen only switched to the Dräger HPS 6200 in 2007. “With the previous helmet from another manufacturer, we had problems with heat damage,” explains Niels-Ole Blirup, Chief of the Copenhagen Fire and Rescue Services. The new helmet had to take more punishment: “We tested six different helmets, sending four firefighter instructors wearing the helmets under consideration into our training building, and the Dräger helmet exhibited the best resistance to heat.” Noting that there have been hardly any material failures after a year in service, Blirup adds, “The helmet is also im-

pervious to strong impacts; the coating of the helmet shell can take a lot of abuse.” Still, even a good helmet can stand improvement. Blirup shared his experiences with Dräger, and one detail of the HPS 6200 was modified as a result. “Based on the experiences during the heat test, we had an additional heat barrier installed in the area of the forehead, since comfort is another important argument in addition to heat resistance,” says Blirup, who is responsible for protecting roughly 600 heads in Copenhagen. “Safety and comfort have absolute priority. If the helmet of the future could be a few grams lighter while offering the same level of safety and the thermal stability, I would be utterly satisfied.”

### On site in the Czech Republic, April 2009

Two men gaze intently through the window into the cleanroom and monitor the work of the special helmet-coating robot. Are all of the spray head motions and settings correct to ensure the even application of the coating? “That looked very good,” opines the coating expert, and his colleague nods in silent agreement. After allowing it to dry, the two men inspect the helmet, looking at it from all sides, checking the edges and the inside. The tension in their expressions gives way to smiles. “The coating was applied perfectly,” says the expert. “We can get started as far as we’re concerned,” his colleague adds. **Mario Gongolsky**

Further information online:  
 New production facility  
[www.draeger.com/97/helmet](http://www.draeger.com/97/helmet)



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## Safety without borders

The **EUROPEAN STANDARDIZATION PROCESS** ensures the greatest possible safety in line with state-of-the-art technology. The current standard for fire helmets, EN 443:2008, is exemplary worldwide. Author Markus Lamm worked on the formulation of this standard as a member of DIN and CEN committees for fire helmets.

Standards guarantee basic safety and comparability, offering a reliable minimum framework, and globalization is driving a transition from national to European and international standards.

DIN 14940, in force in Germany since the Second World War, describes the fire helmet as a head covering offering protection against the effects of impact and heat, comprising a helmet shell, inner lining, a chin-and-neck strap, and neck protection.

Through the end of 1997, every country in Europe followed its own standard. EN 443 has applied throughout Europe ever since, and is reviewed every five years: Is it still appropriate in light of current and future requirements? Where is there room for improvement, such as can be achieved through the use of innovative materials? The fact is that human lives are at stake, after all. It’s all about safety in extreme situations such as fires and chemical incidents, accidents or technical failures, both outdoors and inside buildings.

Of course, standards are also updated in the interest of harmonization. Several years ago, users and manufacturers began an intense discussion regarding the revision of the 1997 version of EN 443, in which Dräger also played a major role.

The result of this was the new fire helmet standard EN 443:2008, which went into effect in February 2008. Technical Committee CEN-TC 158 “Safety Helmets” is responsible on the European level for the formulation of the standard and is assisted on the German side by the “Personal Protective Equipment for Firefighters” working committee of the Firefighting and Fire Protection Standards Committee (FNFW).

The result is impressive: Not only is EN 443:2008 oriented toward current and very realistic scenarios, but many international helmet experts also consider it to be the most rigorous and comprehensive firefighting standard, even in comparison to the requirements of the American NFPA 1971 standard or the Australian helmet standard AS/NSZ 4067.

EN 443:2008 also takes a new approach: Rather than describing structural requirements (as the former DIN 14940 did), it describes the performance requirements for a fire helmet for fighting fires in buildings and other structures. The standard differentiates between two types of helmets for the first time: Type A is the designation for half-shell helmets and Type B for full-shell helmets. Fire departments can choose the helmet best suited to the type of operation, required degree of protection, and ergonomic considerations.

The requirements and test methods were developed primarily from a reassessment of the hazard analysis and in consideration of practical experience.

Some major improvements for even more effective personal protection are:

- ▶ a flame engulfment test in which the equipment is completely engulfed in flames
- ▶ shock absorption after heating
- ▶ penetration after heating
- ▶ increasing the radiant heat to 14 kW/m<sup>2</sup>